

Ion irradiation studies of construction materials for high-power accelerators

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The paper reviews the activities and reports the current results of GSI-INTAS projects that are dealing with investigations of construction materials for high-power accelerators and their components. Three types of materials have been investigated, namely metals (stainless steel and copper), metallic glasses (Nanoperm, Finemet and Vitrovac) and organic materials (polyimide insulators and glass fiber reinforced plastics/GFRP). The materials were irradiated by different ion beams with various fluencies and energies. The influence of radiation on selected physical properties of these materials has been investigated with the aid of gamma-ray spectroscopy, transmission Mössbauer spectroscopy (TMS), conversion electrons Mössbauer spectroscopy (CEMS), optical spectroscopy (IR and UV/VIS) and other analytical methods. Some experiments were accompanied with computer simulations by FLUKA, SHIELD and SRIM codes. Validity of the codes was verified by comparison of the simulation results with experiments. After the validation, the codes were used to complete the data that could not be obtained experimentally.